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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/231,344	09/13/2011	Toshiaki SUZUKI	5298-6	7745

27562 7590 01/25/2017

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ART UNIT	PAPER NUMBER
2617	

NOTIFICATION DATE	DELIVERY MODE
01/25/2017	ELECTRONIC

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte TOSHIAKI SUZUKI and SHIGEFUMI KAWASE

Appeal 2016-002098
Application 13/231,344
Technology Center 2600

Before ERIC B. CHEN, DANIEL N. FISHMAN, and
DAVID J. CUTITTA II, *Administrative Patent Judges*.

CHEN, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134(a) from the final rejection of claims 1 and 3–32. Claim 2 has been cancelled. We have jurisdiction under 35 U.S.C. § 6(b). We affirm-in-part.

STATEMENT OF THE CASE

Appellants' invention relates to generating images by combining real images and virtual images such as computer graphics images. (Abstract.)

Claims 1, 14, and 26 are exemplary with disputed limitations in italics:

> 1. A non-transitory computer readable medium storing an image processing program that is executed by a computer which displays a synthesized image of a real world image and a virtual image on a display device, the image processing program causing the computer to perform functionality comprising:
>
> acquiring a real world image captured by a real camera;
>
> *defining first and second virtual regions in a virtual image based on a boundary surface adjoining the first and second virtual regions, the first virtual region located inside the boundary surface and the second virtual region located outside the boundary surface*;
>
> *generating a synthesized image by synthesizing the real world image and the virtual image depicting a first virtual object, in such a manner that the first virtual object appears to be present behind the real world image when the first virtual object is in the second virtual region*; and
>
> displaying the synthesized image on the display device.
>
> 14. The non-transitory computer readable medium storing the image processing program according to claim 1, *wherein the real world image formed with an opening in a portion thereof is used for generating the synthesized image in*

which the first virtual object is visible via this opening in the generating the synthesized image.

26. The non-transitory computer readable medium storing the image processing program according to claim 1, *wherein a portion of the first virtual object, appearing to be present behind the real world image, is depicted as a silhouette of the first virtual object.*

Claims 1, 3–12, 20, 21, and 23–32 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Tomite (US 2008/0024523 A1; Jan. 31, 2008), Deb (US 2010/0085351 A1; Apr. 8, 2010), and Meier (US 2010/0289817 A1; Nov. 18, 2010).

Claims 13–15, 18, 19, and 22 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Tomite, Deb, Meier, Bassett (US 2004/0219980 A1; Nov. 4, 2004).[1]

Claims 16 and 17 stand rejected under 35 U.S.C. 103(a) as unpatentable over Tomite, Deb, Meier, Bassett, and Cheng (US 2008/0293488 A1; Nov. 27, 2008).

ANALYSIS

§ 103 Rejection—Tomite, Deb, and Meier

Claims 1, 3–12, 20, 21, 23–25, and 28–32

First, we are unpersuaded by Appellants' arguments (App. Br. 13–14) that the combination of Tomite, Deb, and Meier would not have rendered obvious independent claim 1, which includes the limitation "defining first

[1] Appellants do not present any separate arguments with respect to the rejection of dependent claim 13 under 35 U.S.C. § 103(a). Thus, any such arguments are deemed to be waived.

and second virtual regions in a virtual image based on a boundary surface adjoining the first and second virtual regions, the first virtual region located inside the boundary surface and the second virtual region located outside the boundary surface."

The Examiner found that the head mounted display of Tomite, which generates a virtual image of a celestial sphere, corresponds to the limitation "defining first and second virtual regions in a virtual image based on a boundary surface adjoining the first and second virtual regions, the first virtual region located inside the boundary surface and the second virtual region located outside the boundary surface." (Final Act. 4; *see also* Ans. 2–3.) We agree with the Examiner.

Tomite relates to "generating images combining real images and virtual images such as computer graphics images (CG images)" (¶ 2), such that "a CG image [is] combined with a real space image (i.e., a background), according to which a user can feel as if a virtual object is present in the real space" (¶ 4). Figure 2 of Tomite illustrates information processing apparatus 100, which includes head mounted display 101 having a video camera and carried by user 201. (¶ 33.) Tomite explains that "information processing apparatus 100 can generate a virtual image of a celestial sphere 206 by connecting together (e.g., stitching) a plurality of real space images (real images) 205 captured by the video camera." (*Id.*) Furthermore, Tomite explains that "information processing apparatus 100 generates a virtual object 204 having natural brightness and shadow based on the estimated light source information." (¶ 34.) Because Figure 2 of Tomite illustrates celestial sphere 206 having an interior and an exterior, Tomite teaches the limitation "defining first and second virtual regions in a virtual image based

on a boundary surface adjoining the first and second virtual regions, the first virtual region located inside the boundary surface and the second virtual region located outside the boundary surface."

Appellants argue "even assuming for sake of argument that the area inside of the half-sphere in Fig. 2 constitutes a virtual region, Tomite does not image objects from a virtual camera outside of the virtual region (e.g., in a second virtual region beyond the half-sphere)." (App. Br. 14) In particular, Appellants argues,

> even if the area outside of the half-sphere constitutes a "second virtual region," Tomite does not position virtual objects in the "second virtual region," nor does Tomite generate a synthesized image such that the virtual object appears behind a real world object when the object is in the second region.

(*Id.* (emphasis omitted).) However, the Examiner cited to Deb, rather than Tomite, for teaching the limitation "generating a synthesized image" with images in the "first and second virtual regions." (Final Act. 5; *see also* Ans. 3–4.)

Thus, we agree with the Examiner that the combination of Tomite, Deb, and Meier would have rendered obvious independent claim 1, which includes the limitation "defining first and second virtual regions in a virtual image based on a boundary surface adjoining the first and second virtual regions, the first virtual region located inside the boundary surface and the second virtual region located outside the boundary surface."

Second, we are unpersuaded by Appellants' arguments (App. Br. 15–16; *see also* Reply Br. 4) that the combination of Tomite, Deb, and Meier would not have rendered obvious independent claim 1, which includes the limitation "generating a synthesized image" with images in the "first and second virtual regions."

The Examiner found that the virtual camera of Deb, having different fields of view for multiple objects, corresponds to the limitation "generating a synthesized image" with images in the "first and second virtual regions." (Final Act. 5; *see also* Ans. 3–4.) We agree with the Examiner.

Deb relates to "a set of user interface tools for adjusting a region of focus for rendering the space from a particular location within a particular field of view." (Abstract.) In particular, Deb explains that the field of view includes: (i) a first region within the region of focus; and (ii) a second region outside the region of focus. (*Id.*) Figure 3 of Deb illustrates modification of the depth of field properties for virtual camera 105 (¶ 14), including objects 111, 112, and 113, and focal plane 115 (¶ 34), such that "objects 112 and 113 will both appear to be in focus, while blurring effects are applied to object 111" (¶ 39). Similarly, Figure 7 of Deb illustrates "virtual camera 705, and three objects 710, 715, and 720, at different distances from the virtual camera." (¶ 61.) Because Deb illustrates that the depth of field can be modified for three objects, Deb teaches the limitation "generating a synthesized image" with images in the "first and second virtual regions."

Appellants argue that

> Deb is not rendering objects so that they appear in front of a real world surface when they are in a region on one side of a boundary surface, and rendering objects so that they appear behind the real world surface when they are in another region on the other side of a boundary surface.

(App. Br. 15–16 (emphases omitted).) Similarly, Appellants argue that "Deb only defines arbitrary regions for the purpose of determining whether the virtual camera should focus on a particular object, and not whether it should appear in front of, or behind, a real world object." (Reply Br. 4.)

However, the Examiner cited Meier, rather than Deb for teaching the limitation "the real world image and the virtual image depicting a first virtual object, in such a manner that the first virtual object appears to be present behind the real world image." (Final Act. 5–6; *see also* Ans. 4–5.)

Thus, we agree with the Examiner that the combination of Tomite, Deb, and Meier would have rendered obvious independent claim 1, which includes the limitation "generating a synthesized image" with images in the "first and second virtual regions."

Last, we are unpersuaded by Appellants' arguments (Reply Br. 3–5) that the combination of Tomite, Deb, and Meier would not have rendered obvious independent claim 1, which includes the limitation "the real world image and the virtual image depicting a first virtual object, in such a manner that the first virtual object appears to be present behind the real world image when the first virtual object is in the second virtual region."

The Examiner found that Figure 1 of Meier, which illustrates merging real and virtual objects, such that the virtual object is behind the real object, corresponds to the limitation "the real world image and the virtual image depicting a first virtual object, in such a manner that the first virtual object appears to be present behind the real world image when the first virtual object is in the second virtual region." (Final Act. 5–6; *see also* Ans. 4–5.) We agree with the Examiner.

Meier relates to "merging the virtual object with an image of the real environment generated by a recording device." (¶ 1.) Figure 1 of Meier illustrates scenery 1 in which "[t]he virtual object is executed . . . in the form of a sofa 3 which is to be placed behind a real object, here a table 2." (¶ 38.) Because Meier illustrates that sofa 3, a virtual object, is behind table 2, a real

object, Meier teaches the limitation "the real world image and the virtual image depicting a first virtual object, in such a manner that the first virtual object appears to be present behind the real world image."

Appellants argue that "nothing in Meier suggests the concept of having two regions in virtual space where an object will appear in front of a real world object when in a particular region in the virtual space" and "Meier appears to define a 'room' based on information provided from a user (e.g., where the location of walls are in an image) and then use image recognition techniques to determine where real objects are in the image." (Reply Br. 4.) However, the Examiner cited to Deb, rather than Meier, for teaching the limitation "generating a synthesized image" with images in the "first and second virtual regions." (Final Act. 5; *see also* Ans. 3–4.)

Thus, we agree with the Examiner that the combination of Tomite, Deb, and Meier would have rendered obvious independent claim 1, which includes the limitation "the real world image and the virtual image depicting a first virtual object, in such a manner that the first virtual object appears to be present behind the real world image when the first virtual object is in the second virtual region."

Accordingly, we sustain the rejection of independent claim 1 under 35 U.S.C. § 103(a). Claims 3–12, 20, 21, 28, and 29 depend from claim 1, and Appellants have not presented any substantive arguments with respect to these claims. Therefore, we sustain the rejection of claims 3–12, 20, 21, 28, and 29 under 35 U.S.C. § 103(a), for the same reasons discussed with respect to independent claim 1.

Independent claims 23, 24, 25, and 30 recite limitations similar to those discussed with respect to independent claim 1, and Appellants have

not presented any additional substantive arguments with respect to these claims. (*See, e.g.*, App. Br. 18.) We sustain the rejection of independent claims 23, 24, 25, and 30, as well as dependent claims 31 and 32, not argued separately, for the same reasons discussed with respect to claim 1.

Dependent Claims 26 and 27

We are persuaded by Appellants' arguments (App. Br. 17–18; *see also* Reply Br. 7–8) that the combination of Tomite, Deb, and Meier would not have rendered obvious dependent claim 26, which includes the limitation "wherein a portion of the first virtual object, appearing to be present behind the real world image, is depicted as a silhouette of the first virtual object."

The Examiner found that the natural shadow for the virtual object of Tomite and mapping captured images onto the rectangular parallelepiped of Tomite, rather than the celestial sphere, collectively correspond to the limitation "wherein a portion of the first virtual object, appearing to be present behind the real world image, is depicted as a silhouette of the first virtual object." (Final Act. 19; *see also* Ans. 7–8.) We do not agree.

As discussed previously, Tomite explains that "information processing apparatus 100 generates a virtual object 204 having natural brightness and shadow based on the estimated light source information." (¶ 34.) Furthermore, Tomite explains that "in a case where modeling for preliminarily determining the shape and layout of walls and objects in the real space is available, the celestial sphere image generation method may include mapping the captured image 205 on such a modeling shape" such that "[t]he modeling shape is, for example, a rectangular parallelepiped resembling a room." (¶ 48.)

Although the Examiner cited to virtual object 204 of Tomite having a natural shadow and mapping captured image 205 of Tomite onto a rectangular parallelepiped, collectively, the Examiner has provided insufficient evidence to support a finding that Tomite teaches the limitation "wherein a portion of the first virtual object, appearing to be present behind the real world image, is depicted as a silhouette of the first virtual object." In particular, Tomite is silent with respect to a shadow formed on the real space rectangular parallelepiped (or celestial sphere 206), much less placement of virtual object 204 "behind" such real space rectangular parallelepiped (or celestial sphere 206). Accordingly, we are persuaded by Appellants' arguments that "Tomite does not at all indicate that objects within any region are depicted as a silhouette image, let alone depicted as a silhouette image when the object appears to be present behind a real world image." (App. Br. 17 (emphases omitted).)

Alternatively, the Examiner found that the virtual sofa of Meier, as illustrated in Figure 1, corresponds to the limitation "wherein a portion of the first virtual object, appearing to be present behind the real world image, is depicted as a silhouette of the first virtual object." (Ans. 7–8.) In particular, the Examiner found that "a part of the virtual object is located behind a real object and the form of a sofa to be placed behind a real object as a silhouette of the first virtual object in Fig. 1." (*Id.* at 8.) Again, we do not agree.

As discussed previously, Figure 1 of Meier illustrates scenery 1 in which "[t]he virtual object is executed . . . in the form of a sofa 3 which is to be placed behind a real object, here a table 2." (¶ 38.) Figure 1 illustrates

that sofa 3 is depicted as dashed lines behind table 2, such that table 2 overlays sofa 3.

Although the Examiner cited to Figure 1 of Meier, the Examiner has provided insufficient evidence to support a finding that "the form of a sofa to be placed behind a real object as a silhouette of the first virtual object." (Ans. 8.) In particular, Figure 1 of Meier does not illustrate that sofa 3, located "behind" table 2 is depicted as a silhouette. Instead Figure 1 of Meier merely illustrates that table 2 overlays sofa 3. Accordingly, we are persuaded by Appellants' argument that "the sofa in Fig. 1 is illustrated using dashed lines to show its physical placement in the image behind the table" and "Meier does not at all appear to indicate that the sofa is shown as a silhouette when it is behind the table." (Reply Br. 7 (emphasis omitted).)

Thus, we do not agree with the Examiner that the combination of Tomite, Deb, and Meier would have rendered obvious dependent claim 26, which includes the limitation "wherein a portion of the first virtual object, appearing to be present behind the real world image, is depicted as a silhouette of the first virtual object."

Accordingly, we do not sustain the rejection of dependent claim 26 under 35 U.S.C. § 103(a). Claim 27 depends from dependent claim 26. We do not sustain the rejection of claim 27 under 35 U.S.C. § 103(a) for the same reasons discussed with respect to dependent claim 26.

§ 103 Rejection—Tomite, Deb, Meier, and Bassett

We are also persuaded by Appellants' arguments (App. Br. 19–21; *see also* Reply Br. 8–9) that the combination of Tomite, Deb, Meier, and Bassett would not have rendered obvious dependent claim 14, which includes the

limitation "wherein the real world image formed with an opening in a portion thereof is used for generating the synthesized image in which the first virtual object is visible via this opening in the generating the synthesized image."

The Examiner found that the "picture-in-picture" display of Bassett from the first and second virtual cameras, corresponds to the limitation "wherein the real world image formed with an opening in a portion thereof is used for generating the synthesized image in which the first virtual object is visible via this opening in the generating the synthesized image." (Final Act. 26; *see also* Ans. 10.) We do not agree.

Bassett relates to "dynamically manipulating camera angle to provide special effects" for three-dimensional video game play. (¶ 2.) Figure 10 of Bassett illustrates a "'picture-in-picture' display so that the video game player can continue to watch the image from the perspective of the first camera 308a while also having the benefit of an interesting, different image from the perspective of the second camera 308b." (¶ 86.)

Although the Examiner cited to Figure 10 of Bassett, the Examiner has provided insufficient evidence to support a finding that Bassett teaches the limitation "wherein the real world image formed with an opening in a portion thereof is used for generating the synthesized image in which the first virtual object is visible via this opening in the generating the synthesized image." In particular, Figure 10 of Bassett illustrates a "picture-in-picture" display of the image from second virtual camera 308b formed in the image from the first virtual camera 308a, rather than a virtual image in a real image, as required by claim 14.

Accordingly, we are persuaded by Appellants' arguments that "Bassett explains that one virtual camera can be used to follow the moving object where another virtual camera can be used to show the object at a position lateral to the moving object" and "one of ordinary skill would not consider a picture-in-picture window as an opening, let alone an opening in a real world image." (App. Br. 20 (emphases omitted); *see also* Reply Br. 9.)

Thus, we do not agree with the Examiner that the combination of Tomite, Deb, Meier, and Bassett would have rendered obvious dependent claim 14, which includes the limitation "wherein the real world image formed with an opening in a portion thereof is used for generating the synthesized image in which the first virtual object is visible via this opening in the generating the synthesized image."

Accordingly, we do not sustain the rejection of dependent claim 14 under 35 U.S.C. § 103(a). Claims 15, 18, 19, and 22 depend from dependent claim 14. We do not sustain the rejection of claims 15, 18, 19, and 22 under 35 U.S.C. § 103(a) for the same reasons discussed with respect to dependent claim 14.

§ 103 Rejection—Tomite, Deb, Meier, Bassett, and Cheng

Claims 16 and 17 depend from claim 14. Cheng was cited by the Examiner for teaching the additional features of claims 16 and 17. (Final Act. 30–32.) However, the Examiner's application of Cheng does not cure the above noted deficiencies of Tomite, Deb, Meier, and Bassett. Thus, we do not sustain the rejection of claims 16 and 17 under 35 U.S.C. § 103(a) for the same reasons discussed with respect to dependent claim 14.

DECISION

The Examiner's decision rejecting claims 1, 3–13, 20, 21, 23–25, and 28–32 is affirmed.

The Examiner's decision rejecting claims 14–19, 22, 26, and 27 is reversed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED-IN-PART